CLAIMS

1. A method for recovering data transmitted in a wireless communication system, comprising:

receiving a plurality of modulation symbols for a plurality of transmitted coded bits;

deriving first *a priori* information for the coded bits based on the received modulation symbols and second *a priori* information for the coded bits;

decoding the first *a priori* information to derive the second *a priori* information;

repeating the deriving and decoding a plurality of times; and

determining decoded bits for the transmitted coded bits based in part on the second *a priori* information.

2. The method of claim 1, further comprising:

deriving soft-decision symbols for the coded bits based on the received modulation symbols and the second *a priori* information, and wherein the first *a priori* information is derived based on the soft-decision symbols and the second *a priori* information.

3. The method of claim 2, wherein the soft-decision symbols are represented as log-likelihood ratios (LLRs).

4. The method of claim 2, wherein the soft-decision symbols comprise channel information and extrinsic information.

5. The method of claim 2, wherein the soft-decision symbols comprise information for one or more spatial subchannels and one or more frequency subchannels used to transmit the plurality of modulation symbols.

6. The method of claim 1, further comprising:

deinterleaving the first *a priori* information, wherein the deinterleaved first *a priori* information is decoded; and

interleaving the second *a priori* information, wherein the interleaved second *a priori* is used to derive the first *a priori* information.

7. The method of claim 1, wherein the wireless communication system is a multiple-input multiple-output (MIMO) system.

8. The method of claim 7, wherein the MIMO system implements orthogonal frequency division multiplexing (OFDM).

9. A method for recovering data transmitted in a multiple-input multiple-output (MIMO) system implementing orthogonal frequency division multiplexing (OFDM), comprising:

receiving a plurality of modulation symbols for a plurality of coded bits transmitted via a plurality of frequency subchannels of a plurality of transmit antennas;

deriving soft-decision symbols for the coded bits based on the received modulation symbols and second *a priori* information for the coded bits;

deriving first *a priori* information for the coded bits based on the soft-decision symbols and the second *a priori* information;

decoding the first *a priori* information to derive the second *a priori* information;

repeating the deriving the first *a priori* information and the decoding the first *a priori* information a plurality of times; and

determining decoded bits for the transmitted coded bits based in part on the second *a priori* information.

10. The method of claim 9, further comprising:

recovering the modulation symbols for each transmit antenna by nulling the modulation symbols for other transmit antennas, and

wherein the soft-decision symbols for the coded bits transmitted from each transmit antenna are derived based on the recovered modulation symbols for the transmit antenna and the second *a priori* information for the transmit antenna.

11. The method of claim 10, wherein the recovering the modulation symbols for each transmit antenna includes

pre-multiplying the received modulation symbols with a plurality of nulling matrices to derive the recovered modulation symbols for the plurality of frequency subchannels of the transmit antenna.

12. The method of claim 9, further comprising:

for each transmit antenna except the last transmit antenna,

recovering the modulation symbols for the transmit antenna by nulling the modulation symbols for other transmit antennas from input modulation symbols for the transmit antenna, and

canceling interference due to the recovered modulation symbols from the input modulation symbols, and

wherein the input modulation symbols for the first transmit antenna are the received modulation symbols and the input modulation symbols for each subsequent transmit antenna are the interference-cancelled modulation symbols from the current transmit antenna.

13. The method of claim 9, further comprising:

for each transmit antenna except the last transmit antenna,

deriving pre-decoding interference estimates based in part on the soft-decision symbols for the transmit antenna; and

canceling the pre-decoding interference estimates from input modulation symbols for the transmit antenna, and

wherein the input modulation symbols for the first transmit antenna are the received modulation symbols and the input modulation symbols for each subsequent transmit antenna are the interference-cancelled modulation symbols from the current transmit antenna.

14. The method of claim 9, further comprising:

deinterleaving the first *a priori* information, wherein the deinterleaved first *a priori* information is decoded; and

interleaving the second *a priori* information, wherein the interleaved second *a priori* is used to derive the soft-decision symbols.

15. The method of claim 9, wherein the soft-decision symbols are represented as log-likelihood ratios (LLRs).

16. The method of claim 15, wherein a dual-maxima approximation is used to derive the LLRs for the coded bits.

17. The method of claim 9, wherein the soft-decision symbols comprise channel information.

18. The method of claim 9, wherein the soft-decision symbol for each coded bit comprises extrinsic information extracted from other coded bits.

19. The method of claim 9, wherein the decoding is based on a parallel concatenated convolutional decoding scheme.

20. The method of claim 9, wherein the decoding is based on a serial concatenated convolutional decoding scheme.

21. The method of claim 9, wherein the decoding is based on a convolutional decoding scheme.

22. The method of claim 9, wherein the decoding is based on a block decoding scheme.

23. The method of claim 9, wherein the decoding is based on a concatenated convolutional decoding scheme, and wherein a dual-maxima approximation is used for evaluating log-likelihood ratios (LLRs) for the decoding.

24. The method of claim 9, wherein the decoding for each transmit antenna is based on a respective decoding scheme.

25. The method of claim 9, wherein the plurality of modulation symbols are derived based on a non-Gray modulation scheme.

26. The method of claim 9, wherein the modulation symbols for each transmit antenna are derived based on a respective modulation scheme.

27. A receiver unit in a wireless communication system, comprising:

a detector operative to receive a plurality of modulation symbols for a plurality of transmitted coded bits, derive soft-decision symbols for the coded bits based on the received modulation symbols and second *a priori* information for the coded bits, and derive first *a priori* information for the coded bits based on the soft-decision symbols and the second *a priori* information; and

at least one decoder operative to decode the first *a priori* information to derive the second *a priori* information and to determine decoded bits for the transmitted coded bits based in part on the second *a priori* information, and

wherein the first *a priori* information is derived by the detector and decoded by the at least one decoder a plurality of times prior to determining the decoded bits.

28. The receiver unit of claim 27, further comprising:

a deinterleaver operative to deinterleave the first *a priori* information, wherein the deinterleaved first *a priori* information is decoded by the at least one decoder; and

an interleaver operative to interleave the second *a priori* information, wherein the interleaved second *a priori* is used by the detector to derive the soft-decision symbols.

29. The receiver unit of claim 27, wherein the soft-decision symbols represent log-likelihood ratios (LLRs) for the coded bits.

30. The receiver unit of claim 29, wherein the detector is operative to use a dual-maxima approximation to derive the LLRs for the coded bits.

31. The receiver unit of claim 27, wherein the detector is further operative to recover the modulation symbols for each transmit antenna by nulling the modulation symbols for other transmit antennas, and to derive the soft-decision symbols for the coded bits transmitted from each transmit antenna based on the recovered modulation symbols for the transmit antenna and the second *a priori* information.

32. The receiver unit of claim 31, wherein the detector is further operative to pre-multiply the received modulation symbols with a plurality of nulling matrices to

derive the recovered modulation symbols for the plurality of frequency subchannels of each transmit antenna.

33. The receiver unit of claim 31, wherein the detector is further operative to cancel interference due to the recovered modulation symbols for each transmit antenna, and to recover the modulation symbols for each subsequent transmit antenna, except the last transmit antenna, based on the interference-cancelled modulation symbols.

34. The receiver unit of claim 27, wherein one decoder is provided for each independently coded data stream to be decoded by the receiver.

35. The receiver unit of claim 27, wherein the at least one decoder is operative to perform concatenated convolutional decoding on the first *a priori* information.

36. The receiver unit of claim 27, wherein the at least one decoder implements a maximum *a posteriori* (MAP) decoding algorithm.

37. The receiver unit of claim 27, further comprising:

a channel estimator operative to estimate one or more characteristics of a communication channel via which the plurality of modulation symbols are received; and

a transmitter unit operative to process and transmit channel state information indicative of the estimated channel characteristics.

38. The receiver unit of claim 37, wherein the channel state information is indicative of a particular coding and modulation scheme to be used for each transmit antenna.

39. The receiver unit of claim 37, wherein the channel state information is indicative of a particular coding and modulation scheme to be used for all transmit antennas.

40. The receiver unit of claim 27, wherein the wireless communication system is a multiple-input multiple-output (MIMO) system that implements orthogonal frequency division multiplexing (OFDM).

41. A terminal comprising the receiver unit of claim 27.

42. A base station comprising the receiver unit of claim 27.

43. An access point comprising the receiver unit of claim 27.

44. A receiver apparatus in a wireless communication system, comprising:

means for receiving a plurality of modulation symbols for a plurality of coded bits transmitted via a plurality of frequency subchannels of a plurality of transmit antennas;

means for deriving soft-decision symbols for the coded bits based on the received modulation symbols and second *a priori* information for the coded bits;

means for deriving first *a priori* information for the coded bits based on the soft-decision symbols and the second *a priori* information;

means for decoding the first *a priori* information to derive the second *a priori* information, wherein the first *a priori* information is derived and decoded a plurality of times; and

means for determining decoded bits for the transmitted coded bits based in part on the second *a priori* information.

45. The receiver apparatus of claim 44, further comprising:

means for recovering the modulation symbols for each transmit antenna by nulling the modulation symbols for other transmit antennas, and

wherein the soft-decision symbols for the coded bits transmitted from each transmit antenna are derived based on the recovered modulation symbols for the transmit antenna and the second *a priori* information for the transmit antenna.

46. The receiver apparatus of claim 44, further comprising:

means for deinterleaving the first *a priori* information, wherein the deinterleaved first *a priori* information is decoded; and

means for interleaving the second *a priori* information, wherein the interleaved second *a priori* is used to derive the soft-decision symbols.

47. A method for transmitting data in a wireless communication system, comprising:

receiving channel state information (CSI) indicative of one or more characteristics of a communication channel to be used for data transmission;

selecting one or more coding schemes and one or more modulation schemes to be used for the data transmission based on the received CSI;

processing data based on the one or more selected coding schemes to provide coded data;

modulating the coded data based on the one or more selected modulation schemes to provide a plurality of modulation symbol streams; and

generating a plurality of modulated signals for the plurality of modulation symbol streams, and

wherein the CSI is derived at one or more receivers based on iterative detection and decoding of the plurality of modulated signals as received at the one or more receivers.

48. The method of claim 47, further comprising:

interleaving the coded data based on one or more interleaving schemes, and wherein the interleaved data is modulated.

49. A transmitter in a wireless communication system, comprising:

a TX data processor operative to process data based on one or more coding schemes to provide coded data; and

a modulator operative to modulate the coded data based on one or more modulation schemes to provide a plurality of modulation symbol streams, and to generate a plurality of modulated signals for the plurality of modulation symbol streams, and

wherein the coding and modulation schemes are selected based on channel state information (CSI) derived at one or more receivers based on iterative detection and decoding of the plurality of modulated signals as received at the one or more receivers.

50. The transmitter of claim 49, wherein the TX data processor is further operative to interleave the coded data based on one or more interleaving schemes, and wherein the interleaved data is modulated by the modulator.

51. The transmitter of claim 50, wherein one interleaving scheme is used for each modulation symbol stream.

52. The transmitter of claim 50, wherein one interleaving scheme is used for each group of one or more modulation symbol streams.

53. The transmitter of claim 50, wherein the coded data is interleaved over time and space.

54. The transmitter of claim 50, wherein the coded data is interleaved over time, frequency, and space.

55. The transmitter of claim 49, further comprising:

a controller operative to receive the CSI and to select the coding and modulation schemes based on the received CSI.

56. The transmitter of claim 50, further comprising:

a controller operative to receive the CSI and to select the coding, interleaving, and modulation schemes based on the received CSI.

57. The transmitter of claim 49, wherein the one or more coding schemes comprise a parallel concatenated convolutional code.

58. The transmitter of claim 49, wherein the one or more coding schemes comprise a serial concatenated convolutional code.

59. The transmitter of claim 49, wherein the one or more coding schemes comprise a convolutional code.

60. The transmitter of claim 49, wherein the one or more coding schemes comprise a block code.

61. The transmitter of claim 49, wherein the one or more modulation schemes are non-Gray modulation schemes.

62. The transmitter of claim 49, wherein the one or more modulation schemes are anti-Gray modulation schemes.

63. The transmitter of claim 49, wherein a separate coding scheme and a separate modulation scheme are used for each of the plurality of modulated signals.

64. The transmitter of claim 50, wherein a separate coding scheme, a separate interleaving scheme, and a separate modulation scheme are used for each of the plurality of modulated signals.

65. The transmitter of claim 49, wherein a common coding scheme and a common modulation scheme are used for the plurality of modulated signals.

66. The transmitter of claim 50, wherein a common coding scheme, a common interleaving scheme, and a common modulation scheme are used for the plurality of modulated signals.

67. A transmitter apparatus in a wireless communication system, comprising:

means for processing data based on one or more coding schemes to provide coded data;

means for modulating the coded data based on one or more modulation schemes to provide a plurality of modulation symbol streams;

means for generating a plurality of modulated signals for the plurality of modulation symbol streams, and

wherein the coding, interleaving and modulation schemes are selected based on channel state information (CSI) derived at one or more receivers based on iterative detection and decoding of the plurality of modulated signals as received at the one or more receivers.

68. The transmitter apparatus of claim 67, further comprising:

means for interleaving the coded data based on one or more interleaving schemes to provide a plurality of coded and interleaved data streams, and wherein the interleaved data is modulated.